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Assessing the Human Resource Needs of Alberta's Information Technology Sector

Prepared by Kernow Enterprises Inc
for Alberta Advanced Education and Career Development

August 1998

Alberta
ADVANCED EDUCATION AND
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ISBN: 0-7785-0609-6

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Executive Summary

The key to the future of any advanced economy today is the application of knowledge and innovation. As in other parts of the country and the world, natural resource endowment is no longer sufficient to ensure prosperity for future generations of Albertans. Information technology is a key catalyst of an knowledge-based society and its influence will be felt throughout our economy. A highly skilled and knowledgeable workforce is the cornerstone of our ability to innovate and continue to push the frontiers of knowledge. Many Canadian studies indicate that occupations requiring high levels of education and skill have been growing faster than those requiring lower skilled workers. In recent years, information technology industries have consistently been outperforming low-knowledge industries.

This report summarizes the results of a study commissioned by Advanced Education and Career Development in the spring of 1998. The key objective of the study is to provide a broad overview and qualitative perspective on the current and future status of Alberta's Information Technology (IT) sector with emphasis on the short- and long-term human resource requirements of the high-knowledge sector in Alberta. The study will assist government and other stakeholders in developing strategies to help this sector build the long-term capability needed to succeed in the increasingly global economy.

The study consisted of interviews with 42 senior representatives of Alberta's major industries as well as relevant organizations and academic institutions. Study participants were asked to share their views on a variety of issues ranging from whether in fact there were any IT human resource problems to possible solutions for recruiting more females into IT careers.

Key Findings

Following are key findings of the study. A more detailed discussion of these findings is presented later in the report:

- The survey indicates an overall shortage of experienced IT professionals in many areas.
- There was a consensus of views regarding strong future growth of the IT sector in Alberta over the next few years.

- There is not a widespread loss of IT graduates or talent to the rest of Canada.
- The loss of IT professionals to the United States is perceived as a serious problem.
- Many large resource-based and manufacturing companies have contracted out most of their fundamental IT functions to specialists.
- The multi-media industry is a rapidly emerging sector of the IT field.
- The current focus on the Y2K issue is a complication in assessing longer term trends in IT.
- In terms of their technical capabilities, there was general agreement on the high quality of graduates being produced by post-secondary institutions.
- Industry is concerned about the relatively low levels of females entering certain IT occupations, especially those in engineering and technology.
- There were several proposals to encourage greater interest in IT as a career.
- There is universal praise for co-op/internships programs.
- Funding for post-secondary institutions and students is perceived as a problem from several perspectives.
- A recurring theme was the shortage of experienced project managers for IT implementation projects.
- There is a crucial need for more quantitative information on the IT sector.
- A more cooperative approach among organizations and institutions on gathering and interpreting information on the IT sector would go a long way to improving the overall data base.
- While increasing supply of graduates is a key strategy for meeting the growing human resource needs of the Alberta IT sector, other avenues also offer good short term potential.

Introduction

This report summarizes the results of a study commissioned by Alberta Advanced Education and Career Development in the spring of 1998. The key objective of the study was to provide a broad overview and qualitative perspective on the current and future status of Alberta's Information Technology (IT) sector with emphasis on the short- and long-term human resource requirements of the high-knowledge sector in Alberta. The study will assist government and other stakeholders in developing strategies to help this sector build the long-term capability needed to succeed in the increasingly global economy.

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Background

Alberta and Canada in the World: Maintaining Global Competitiveness

The key to the future of any advanced economy today is the application of knowledge and innovation. As in other parts of the country and the world, natural resource endowment is no longer sufficient to ensure prosperity for future generations of Albertans. Our ability to remain among the top economic nations of the world will ultimately depend on our success in developing knowledge-intensive industries, the foremost of which will be information technology. Not only is this industry important in its own right, but it will enable other industries to enhance their own global competitiveness.

Growth in IT Industries and Occupations

The IT industry is one of the world's fastest growing economic sectors. In recent years, information technology industries have consistently been outperforming low-knowledge industries. Experts forecast continuing annual growth of about 8-10 percent for at least the next ten years. While Alberta accounts for a mere 0.3 percent of today's IT market worldwide, this already translates into an $8 billion business employing about 40,000 people. Given predicted growth, this 40,000 is just the "tip of the iceberg" in terms of future employment in IT industries and occupations.

The Challenge Ahead

Despite the obvious opportunities, evidence continues to suggest that the supply of qualified workers in IT is not keeping pace with demand. In fact, a shortage of skilled IT professionals is even more pressing in Alberta than elsewhere in Canada because of our strong economy. Indeed, participants in the 1997 Minister's Forum on Adult Learning suggested that, in both the short-and long-term, there may be inadequate human resources for both the information technology and pharmaceutical industries.

Adequate human resources in IT is now potentially one of the most urgent issues for Canadian and Albertan companies. In today's highly competitive global marketplace, the "IT people factor" has the ability to virtually make or break a business.

With its excellent IT, business, research and educational infrastructure - buttressed by a strong economy - Alberta has the potential to become a hub of IT activity in Canada and indeed, the world. We have the tools to be major players in the global IT industry. The challenge will be to ensure that we have the highly skilled, qualified and knowledgeable people to use those tools.

Objectives of the Study

The major objective of the study was to provide a broad overview and qualitative perspective on the current and future status of Alberta's information technology sector. The study focuses on identifying the critical human resources issues facing this sector as seen by key industry players. The labour market review is intended to assist government policy makers to understand the province's information technology landscape. This will enable the development of appropriate human resource policies and programs.

In this report, Information Technology (IT) is considered to have two main dimensions: the information technology industries themselves, and the use of information technology within other industries. Thus, the study includes a review by industrial sector and by occupational group. The main focus is on the human resource requirements of the IT sector and the IT requirements of other key industrial sectors.

The study identifies key sectors or sub-sectors where the IT function is heavily related to the industry's growth and prosperity. It identifies the type of workers required and examines critical education and/or training paths. Using the findings from the interviews, the report summarizes the key issues and challenges facing IT development in Alberta. The report also indicates where current information is inadequate or unavailable and makes recommendations on what additional knowledge is needed to complete the analysis of the human resource requirements of Alberta's information technology function.

Methodology

Interviews

The study consisted of 42 interviews, mainly with senior management of Alberta's major industries as well as representatives of relevant industry associations, business organizations and academic institutions. Over 95 percent of the interviews were conducted in person with the remainder being done by telephone. A list of interview questions is provided in Appendix A. Appendix B contains a list of study participants.

Industry Coverage

Industries covered in the study included Oil and Gas, Communications and Utilities; Finance and Insurance; Business Services; and Manufacturing. Within the manufacturing sector the following sub-sectors were covered: Furniture and Fixtures; Paper and Allied Products; Printing, Publishing and Allied Industries; Electrical and Electronic Products Industries; and the Chemical Industry.

In addition to a broad spectrum of industries, emphasis also was placed on companies that actually specialize in various aspects of the IT industry. Such companies include those involved in software development, communications products and services and engineering. The study also attempted to cover a cross-section of company sizes ranging from a few employees to several thousand employees. Those companies who were not actually part of the IT industry were selected for the study because IT plays a particularly critical role in their operations. Additional insights were gained by interviewing experts in industry associations and organizations as well as a range of post-secondary educational institutions.

Qualitative Nature of Study

The study was largely qualitative in nature and is therefore a compendium of views of the individuals interviewed. In addition, the interview process was strongly oriented towards specialists in the information technology field and accordingly reflects these innate biases. In the world at large, information technology cannot be identified as clearly and is part of a larger set of skills needed to run a successful business.

It is also important to recognize that while information technologies may sometimes be an end to themselves, in many cases information technology is an enabler or tool. It allows a business objective to be achieved more effectively or productively. Despite its critical role, IT is only one component of a complex intellectual matrix that contributes to success in a competitive global economy.

Findings and Themes

The study yielded critical information about the human resource issues facing both information technology sector and information technology occupations. Following are the findings from interviews with industry experts. The comments are grouped by actual interview question categories and by emerging themes and trends.

Key findings are presented first. A detailed discussion of other findings follows. Also included under “Other Findings” are additional comments on some of the key findings, for example, the Year 2000 issue.

Key Findings

- **The survey indicates an overall shortage of experienced IT professionals in many areas.** Alberta is not alone in experiencing this shortage. Other parts of Canada, especially Ontario, are also experiencing problems. The market for IT workers is bigger in Calgary than Edmonton; Calgary now faces more acute shortages. The salary levels in Calgary are about 20 percent higher compared to Edmonton. Many of those surveyed, however, thought that it was only a matter of time before Edmonton also experienced general shortages of both new graduates and experienced workers.

- **There was a consensus of views regarding strong future growth of the IT sector in Alberta over the next few years.** Many mentioned annual growth rates of 10-15 percent for the next 1-5 years. Most agreed that the lack of qualified and experienced people could compromise this growth rate, unless the number of new graduates and experienced people was increased.

- **There is not a widespread loss of IT graduates or talent to the rest of Canada**. Indeed, with its strong economy and lifestyle characteristics, Alberta seems to have no problem attracting qualified people from other provinces, particularly Saskatchewan, British Columbia and the Maritimes. However…

- **The loss of IT professionals to the United States is perceived as a serious problem.** This is accentuated by a perception that the US is skimming off some of the best and brightest of our graduates and experienced IT people. Given perceptions about our unfavourable tax system compared to the US and the continuing decline in the Canadian dollar it will be increasingly difficult to stem this southward flow of talent. Some study participants provided anecdotal evidence that a segment of those going to the US view that country as a temporary workplace where they can build up capital before returning to Canada to work or set up their own IT companies. **No quantitative data exists on the magnitude of this trend.**

- **Many large resource-based and manufacturing companies have contracted out most of their fundamental IT functions to specialists.** IT companies manage the development, operation and maintenance of all IT activities in the organizations. This allows organizations to focus on integrating their systems, resolving system problems related to the actual business function and on the overall business aspect of their operations.

- **The multi-media industry is a rapidly emerging sector of the IT field.** Multi-media remains a small and fragmented industry in Alberta and may be in for a period of consolidation. Somewhat surprisingly, this area generally did not have shortages of qualified IT people. This may be because prospective employees think this is an exciting, high profile area. However, many industry representatives complained that students lack the calibre of artistic creativity required to put them at the "cutting edge" of this very competitive field.

- **The current focus on the Y2K issue is a complication in assessing longer term trends in IT.** Justifiably, this issue is consuming considerable IT resources, including skill sets that may become increasingly obsolete post-2000 (for example, Fortran and Cobol programming skills). This may offer a challenge and opportunity in terms of retraining long-time IT specialists for new roles.

- **In terms of their technical capabilities, there was general agreement on the high quality of graduates being produced by post-secondary institutions.** The system seems capable of meeting increased demands provided additional targeted funding is available to address equipment needs and attraction and retention of key human resources. Many interviewed were concerned that graduates lacked "softer" skill-sets and good business sense. This is considered an area for substantial improvement.

- **Industry is concerned about the relatively low levels of females entering certain IT occupations, especially those engineering and technology.** There was a feeling that we are missing a large pool of talent. Many believe that this problem stems from high schools where females received negative feedback on IT, both from peer pressure and poor career guidance.

- **There were several proposals to encourage greater interest in IT as a career.** Many mentioned programs targeted at high schools such as junior achievement and math/science competitions as one way to "spread the IT word". Youth internships were also mentioned as a vehicle for enhancing awareness of IT as a prospective career path.

- **There is universal praise for co-op/internships programs.** Many thought these should be expanded at the high school level with emphasis on the longer work term periods offered by internships. Internships enable students to work on more meaningful and longer term projects. Mentorship was another alternative with students working closely with an industry/business associate in a learning partnership.

- **Funding for post-secondary institutions and students is perceived as a problem from several perspectives.** Some educational institutions could graduate more students in areas of particular shortages such as computer engineering, but are hindered by lack of facilities and inability to retain staff. Funding is also becoming a problem for students with many now building up substantial debt loads from 2-3 year IT programs. This is aggravated at some institutions by their need to lease expensive computer equipment. This may present an opportunity for more private investment.

- **A recurring theme was the shortage of experienced project managers for IT implementation projects.** This is a particularly serious issue as a project manager can make or break the effectiveness and timeliness of project completion. This may present an opportunity for the development of a specific IT project management course or qualification. One participant suggested using redundant or retired military personnel with some IT experience or perhaps mainframe computer specialists. Many of these people may have outdated, but still fundamental, skills in IT and excellent project management experience.

- **There is a crucial need for more quantitative information on the IT sector.** We need to collect more solid labour market information on IT, including: the definition of the IT sector, its employment prospects, which occupations are in most demand and its overall contribution to Alberta's economic activity. While interviews with experts can provide valuable insights into the human resource challenges of the IT sector, any data collected is qualitative in nature. An issue that kept recurring in our interviews was the lack of information about the IT sector.

- **A more cooperative approach among organizations and institutions on gathering and interpreting information on the IT sector would go a long way to improving the overall data base.** Part of the problem is fragmentation of information. The Software Human Resources Council in Ottawa is doing some excellent work on occupational descriptions and classifications for the IT field. This goes well beyond the National Occupational Classification which is woefully out-dated on this rapidly emerging field.

- **While increasing supply of graduates is a key strategy for meeting the growing human resource needs of the Alberta IT sector, other avenues also offer good short term potential.** Retraining experienced IT professionals who may lack some of the new and emerging programming techniques may be a practical alternative. Recruitment through immigration, particularly from countries in southern and southeastern Asia, may also help address shortages.

Other Findings

Market Demand

- **Until recently, supply – demand conditions for new IT graduates in Alberta were better balanced.** However, the continuing growing demand for experienced staff coupled with short supply is forcing companies to hire more new graduates and train on the job. The interviews confirmed, however, that in this highly competitive environment businesses very much prefer experience over new graduates. Whether they get the experienced IT professionals remains a question.

- **The current market for new graduates is generally more balanced in Edmonton than Calgary.** However, further growth is expected in Edmonton over the next few years. This will likely result in shortages of new graduates if the supply stays at present levels. One Edmonton company increased salaries of their key IT staff by as much as 30 percent over the last year in order to retain them.

Shortages of Occupations or Skills

- **Generally the feedback suggests shortages across all occupations and skills. However, many felt that the severity of the problem increased at the "high end" of IT personnel.** Some occupations were mentioned often as being in short supply. These included:
    - radio frequency (RF) engineers
    - process control specialists
    - electronic engineers
    - database designers and administrators
    - network specialists and designers.

  Other specific shortages mentioned often included experienced people such as :
    - software developers
    - systems designers and embedded systems developers
    - computer engineers
    - programmers and systems implementation specialists skilled in SAP, Oracle, Visual Basic, Java, C and C++, AS400 and Object Oriented Software
    - project managers
    - high tech creative web and internet designers

Future Growth

- **Some IT firms interviewed had their primary markets outside of Alberta - in central Canada or the US - because of their type of specialization** (e.g. manufacturing control processes, or convergent billing of the telecommunication and utility industries). There appear to be several niche-specific companies, whose markets are truly global for their narrow product or service specialty. Their health is clearly tied directly to the health of the global economy.

Expected Qualifications and Skills

- **One of the biggest dilemmas that kept arising in our interviews was the problem of specialists versus generalists.** In many respects the IT sector tends to require well trained specialists in precise areas of hardware or software design, products or services. Yet, many interviewed kept mentioning the need for generalists rather than just hard-core "techies".

By "generalists", interviewees also wanted workers who had a broader set of competencies than technical know-how alone. In other words such competencies as: business sense and knowledge, ability to see the big picture and an all-round set of "softer" skills such as team working skills, networking skills, leadership skills and communication skills are all being sought by employers.

- **Another interesting finding arose from our interviews with IT or human resource people in other industries such as resource and manufacturing companies. Many of these companies were not looking for high numbers of people trained solely in IT.** They had decided to contract out IT functions to specialized computer businesses such as SAP, SHL Systemshouse, IBM and DMR. Thus, many resource-based companies and manufacturing companies were now out of system development and into integration and resolution of business systems problems. In turn, many of these companies were looking for a different type of IT graduate – one with well-rounded IT skills blended with business expertise and "softer" skills. In many cases, companies preferred people with dual qualifications in business and IT.

Preferred Educational Programs

- **Educational institutions and employers alike endorsed the co-op/work internship program type.** It introduces students to the workplace, gives them some valuable experience and allows them an opportunity to practice the newly acquired knowledge. The main suggestions for further improvement included:
    - increase the number of these programs and/or the number of available places
    - increase the length of the work placement period to 8 or more months (from the current 4 months)

- **Longer work placement would allow companies to involve students in longer-term, more complex projects and improve their experience.** Some people were concerned that some co-op placements were not particularly challenging or enriching and that some companies saw these programs as a source of cheap labour. More diligent monitoring of these programs may benefit students' learning and career development.

Student Demand and Characteristics

- **There is a growing student demand for limited spaces in IT programs.** For example, the University of Alberta's Electrical and Computer Engineering program accommodates 65 new students but typically gets about 170 qualified applicants. Only those with an academic average of 80 percent or higher are considered for admission. This is happening at a time when industry could absorb many more qualified graduates. For the educational institution, however, this is seen as a funding challenge related to lack of facilities and qualified staff.

- **The student pool and the IT field itself is dominated by males, although many institutions commented that females tend to do very well, and in many programs outperform males.** One institution revealed that it had a 50:50 male-female split in its business programs, a 65:35 split in its computer programs and a 80:20 male-female split in its computer and engineering technicians and technologists programs.

- **Another challenge for post-secondary institutions is a marked shift in demographics, with a distinct aging of the student population.** This likely will require even more flexible and customized programming schedules to meet the needs of a more mature student population.

Student Costs

- **Affordability is perceived as an issue for IT students**. Some survey respondents commented that affordability may have a negative impact on the future supply of IT graduates.

Related Educational Issues

- **Some post-secondary institutions have reported experiencing difficulties in attracting and retaining qualified instructors due to industry demand and salary differentials.** Space and equipment also are key considerations in any expansion or ongoing improvement of programs.

- **Most companies recognize that it is not easy for post-secondary institutions to keep up with the latest technology and industry demands for highly specific IT skills.** Some suggested that institutions enter into partnerships with major technology developers and vendors to certify students in specific technologies in addition to the regular programs. For example, IBM/ISM and SAP are beginning to pursue discussions of this idea with some of the institutions.

- **Many agreed that there is not enough awareness of IT careers generated in the elementary and high school systems.** (a frequent comment from employers was that *"we still graduate too many lawyers and liberal arts types and not enough people with mathematics and science knowledge.")* Some people mentioned greater emphasis on programs such as junior achievement and math/science competitions with "real" prize money. A common feeling was that industry had to become more engaged and proactive at the high school system level. Interviewees also commented that IT skills are not being sufficiently incorporated into the non-IT fields of study in universities and colleges

- **Small business in Alberta offers very specific opportunities for student workplace experience.** Win-win situations are possible where the small business has virtually zero IT expertise and students have the opportunity to share pertinent IT background, while benefiting from business learning. One interviewee suggested that the student could be backed up in some way by post-secondary instructors as consulting advisors.

Attracting and Retaining Staff

- **Retaining experienced staff is becoming a problem.** This is especially true in Calgary where people can walk across the street for a "better deal". The Calgary Research and Development Authority recently facilitated a workshop of over 50 people from the information and communications technology industry, educational institutions, government and consulting organizations. The workshop addressed the problem of growing shortages of people with appropriate information and communications skills. The workshop outcome was to establish three task forces to address:
    - retaining staff
    - training and retraining staff
    - attracting staff

- **Companies attempt to hire within Alberta before going elsewhere**. It is expensive to relocate people. Alberta seems fortunate in attracting people from other parts of Canada due to lifestyle, cost of living and a strong economy. This inflow, particularly into the Calgary area, has assisted in improving the supply somewhat. IT professionals came primarily from British Columbia, Saskatchewan and Atlantic Canada. However, several participants mentioned the expense of hiring out of province, especially for experienced people. One participant mentioned an average recruitment cost of $39,000 for an out-of-province hire.

Industry Suggestions for Addressing Shortages

- **Some participants suggested that certain scholarships and student loans could require students to work in Alberta for at least for an initial time period.** Without this commitment scholarships would be repaid and interest on student loans would start accruing from the initial receipt date rather than on completion of studies. This would be modeled on the scholarship programs in the military which require a certain committed work period after graduation. The problem with this concept is the practicality and overall enforceability especially if the target of this initiative is students leaving for the US market.

- **Some participants expressed frustration at the lack of creativity and flexibility in reward systems among many Alberta businesses.** It was agreed that there are no easy solutions to the migration of graduates to the US market. It was also unanimously agreed that we cannot compete with the overall level of US salaries and benefits. However, if businesses went beyond the "standard offer" and offered more creative compensation packages, it may help stem the flow.

  A possibility could be creating financial incentive package geared to an escalating system of bonuses and stock option rewards. This could be based on employees remaining with an employer for a minimum period of perhaps three years.

- **Some companies suggested streamlining current immigration/work visa processes to speed up entry into Canada of experienced IT professionals who have a job offer pending or job offers in areas of particularly critical shortages.**

More on the Year 2000 (Y2K) Problem

- **The Year 2000 (Y2K) issue came up in many of the interviews and in many respects complicates the longer-term trends in IT human resource requirements.** This problem is consuming significant resources and of course is essentially a concern only until the year 2000. (However, some observers outside the study think that the Y2K problem will still require resources until well into 2001. The magnitude of the problem remains controversial with the debate polarized between the optimists who believe that the problems are in the advanced stage of resolution and the doomsayers, who believe that significant negative economic impact arising from lack of action is inevitable.)

- **A more interesting question about Y2K is what one-time peak demand is being created by this discrete, yet far-reaching event**. Is the demand for experienced IT people to address this issue creating a one-time exaggerated demand? Will a large number of IT people will be freed up for other IT projects post-2000? These are intriguing questions. Most businesses, institutions and government departments have to address this issue in some way.

- **There seem to be two schools of thought on approaching the Y2K issue.** Many are using it as an opportunity to replace aging systems and leap into more advanced technologies such as SAP, Oracle, object-oriented software etc. Alternatively, a number of businesses are responding by fixing existing aging systems (the "band aid" approach) for the Y2K problem and will address the new systems problem post-2000 - one thing at a time. Fixing existing systems requires expertise in old programming languages such as Fortran and Cobol. Because of the Y2K problem, this skill-set has had a rebirth of sorts. Many interviewed told of people coming out of retirement to ride this temporary wave of demand.

Appendix A

Questionnaire

Assessing the Human Resource Needs of Alberta's Information Technology Sector

Number of Workers

1. To what extent are businesses in the information technology sector experiencing difficulty filling skilled positions? And to what extent is retaining employees a problem?

2. Do most of the new employees in information technology firms come from Alberta? If workers are coming from outside the province, what are the reasons employers are hiring these workers?

3. If there is an adequate supply of Alberta workers, what role does competition from out-of-province employers play in this reduced supply? That is, is the lack of workers primarily caused by an inadequate supply of graduates from Alberta's post-secondary institutions or a depletion of the graduate stock due to attractive employment offers from out-of-province companies?

4. If employers are having to hire people from out of province, how large a problem do they perceive this to be?

5. What do information technology firms think their employment requirements will be in the next five years? What are the key factors determining these growth patterns?

6. What strategies would they suggest for meeting the short- and long-term human resource requirements? What roles would industry and government play in implementing these strategies?

Type of Workers

1. If there are shortages of skilled workers, are these occurring in all information technology occupational categories or are they restricted to certain types of occupations?

2. Is the demand for qualified workers particularly acute in some industries? Which industries are these?

3. How effective is the post-secondary system in providing qualified graduates? What are the strengths and weaknesses of current post-secondary programming?

4. If there are gaps between the supply of graduates from the post-secondary system and the human-resource requirements of the information technology sector, how extensive are these gaps and are they concentrated in particular fields of study?

5. In their hiring, are information technology firms primarily looking for recent post-secondary graduates, or graduates who also have at least some degree of experience? That is, if post-secondary programs are modified or created to generate workers for this sector, will this help the information technology sector in the short run or the long run?

6. If post-secondary programming is amended, should changes focus primarily on creating more of the same type of programming or on offering programming in different ways?

Appendix B

Companies and Organizations Interviewed

Information Technology Sector

Academic Technologies for Learning, Edmonton
David Aplin and Associates, Calgary and Edmonton
CAE Aviation Limited, Edmonton
Christie Communications, Edmonton
Computalog Ltd., Calgary
Computing Devices Canada Limited, Calgary
EDS Canada Limited, Calgary
IBM/ISM, Calgary and Edmonton
Keane Canada Inc., Calgary
Minerva Technology Inc., Calgary
Montage IT, Calgary
Nortel, Calgary
Novatel Communications, Calgary
OZ New Media, Edmonton
SAP, Calgary
Saville Systems, Edmonton
Shana Corporation, Edmonton
Smart Technologies, Calgary
Stanley Associates Engineering Limited, Edmonton
Taylor Industrial Software, Edmonton
Tecskor Software Inc., Calgary
Telus Communications Inc., Calgary/Edmonton
Vicom Multimedia, Edmonton
Willowglen Systems Inc., Edmonton

Other Sectors*

Alberta Energy Company, Calgary
Alberta Pacific Forest Industries Inc. (ALPAC), Edmonton
The Mutual Group, Toronto
Novagas Transmission, Calgary
Price Waterhouse, Partner, Calgary
Royal Bank, Calgary
Shell Canada Limited, Calgary

*Sectors where IT plays a critical role in operations.

Industry Associations

Electronics Industry Association of Alberta, Edmonton
Printing and Graphics Association of Alberta, Calgary
Edmonton Multimedia Industry Association and Edmonton New Media, Edmonton

Organizations

Calgary Chamber of Commerce, Calgary
Calgary Research and Development Authority, Calgary
Economic Development Edmonton, Edmonton
Software Human Resource Council, Ottawa

Academic Institutions

University of Alberta, Edmonton
University of Calgary, Calgary
DeVry Institute of Technology, Calgary
Southern Alberta Institute of Technology, Calgary

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